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ABSTRACT

The conceptions of information needs of seven American and seven Swedish mechanics employed by a Swedish multinational machine industry are compared by using perspective text analysis to analyze their verbal responses to three open-ended questions concerning their need for work-related information. The structures embedded in the texts are visualized in three-dimensional cubic spaces, and the results are discussed with respect to their dimensionality, as well as to the phase spaces of the cognitive processes. Results indicate that the Swedish mechanics seem to subordinate themselves to the company and are unconcerned about obtaining information of a technical nature. The American workers, however, feel that their worth is insufficiently recognized and express a need for instruction to be provided by the company to facilitate their understanding of technical information. It is concluded that this divergence in information needs between the American and Swedish mechanics ought to have considerable effects on the information policy of the industry. (KM)

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A Cognitive Economics Approach to Information Management

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Abstract

This article presents a study in cognitive economics. It originates from a survey of mechanics carried out by a Swedish multinational machine industry. The verbal response of 7 US and 7 Swedish mechanics to three open quesstions concerning information needs were analyzed with Perspective Text Analysis. Only configurations building on significant groupings which do not fall below the lower limit of $t_{.90}$ of the t-distribution are retained in the analysis. The structures embedded in the texts are visualized in three-dimensional cubic spaces. The results are discussed with respect to their dimensionality as well as to the phase spaces of the cognitive processes. They show that US and Swedish workers diverge considerably in their conception of information needs related to their work, which should have consequences for the information management of the industry.

The development of competence is highly dependent on the possibilities of preserving knowledge whether in institutions, companies, or in society as a whole. In many scientific fields, attention is devoted to questions on how information should be presented and organized in a human context. This article reports on a way in which information management could profit through cognitive economics. Its focus is on the cognitive processes involved in " knowledge work ", especially their conditions at the cutting edge of living and non living systems.

There is an articulated interest today in cognitive processes the way they relate to economic settings. Thus for management, it is important to get hold of the individual employee's conception of reality and need for information in his work. This new area of research has come about as the result of the technological development with its requirements on precision and progress. The economical success of a particular group of companies or a certain enterprise rests on their ability to form policies with respect to the development of new competences or maintain those already developed. Information needs play an important role in this process, as well as in the development of mechanic instruments and workshop equipment. The objectives are partly to produce materials, techniques, and processes, partly to follow up the economical consequences of the warranted quality of hardware.

The Cognitive Science Research Unit at Lund University has developed a method, " Perspective Text Analysis " (Bierschenk & Bierschenk, 1986, a, b, c), by means of which the cognitive structure of a person or group of persons can be analyzed on the basis of their natural language utterances. The method has been used in various studies, such as annual reports of management and policy statements. The studies carried out sofar all point in the same direction: (1) A well functioning industry or organization is dependent on the knowledge models according to which the key persons are working, and (2) knowledge about how these models operate in information processing can be used for instruc-

tion and innovative processes.

The conditions of information management are different for business administrations mainly steered by their budget or by their markets respectively. In the latter case, the sensitivity to information needs,by necessity, is high because policies have to be formed in cooperation with the markets. Thus agreement on which course of action constitutes the policy of a particular company is dependent on the perspective of the policy makers on events related to the market. The action to be taken should have a wide ramification and a long time perspective. Policy formation needs to be concerned with social and intellectual processes. This means that the policy maker should deal with such matters as the individual's allocation of time and degree of attention payed to information search processes. Since the individual's sensitivity to time is intimately related to his sensitivity to justice, policy formation incorporates also a moral aspect. This relation may be expressed as an attention to every-day problems.

The present study compares the mentality among American (US) and Swedish workers (mechanics) employed by a Swedish multinational machine industry. Through Perspective Text Analysis it has been possible to visualize, in a cubic space, the cognitive structure of the two groups as regards their information needs. The divergence between the US and Swedish mechanics ought to have considerable effects on the information policy of the industry in question.

US Workers' Conception of Reality

This study originates from an extensive questionnaire, in which, among others, the following questions were posed to US mechanics:

1. Do you have any ideas/suggestions how to encourage more mechanics to use the service manuals?
2. Do you have any suggestions how getting information to you can be improved?

3. Do you think too much (or too little) paper (information) is sent out?

Only 19 useful unrestricted responses were obtained. From these, 7 were randomly selected to be compared with the entire Swedish responses (in all 7). With respect to the presentation of the realized category structures, the US material presented in Figure 1 will be discussed first.

The background of the cube represents the Figure component. The upper left part of the left hand side of the cube takes up the Means component. At the base of the cube, relations of the Ground component are visualized. The foreground takes up the perspective on the Ground. All categories exceed the lower bound $t_{.90}$ of the confidence interval of the t-distributions.

The edges of the planes represent the terminal states of the process of textual transformation. In considering the Figure component, the edges at the left hand side represent a distinct state phase, which can be discerned as Contextualized Information. The edges in the base indicate Information Constraints, while the edges at the right hand side mark Information Flow. At the top, Pretension provides a reference point for the last phase.

The next step in the description of the Figure component may be taken in order to discern the dimensionality of the component. There are two different kinds of dimensions. By drawing horisontal lines, cognitive dimensions can be extracted. Starting from the base, the first dimension may be described as Capability, the second one with Constructiveness and the third one with Power. By drawing vertical lines, four theme specific dimensions can be read from the Figure component. Reading from left to right, these are (1) Proficiency, (2) Honour, (3) Trustworthiness, and (4) Entrustment.

The cognitive process depicted in the background of the cube starts in the terminal state of Declination and ends in the singularity marked by Worthiness. This process is characterized by three cycles. The first cycle reaches its highest point marked

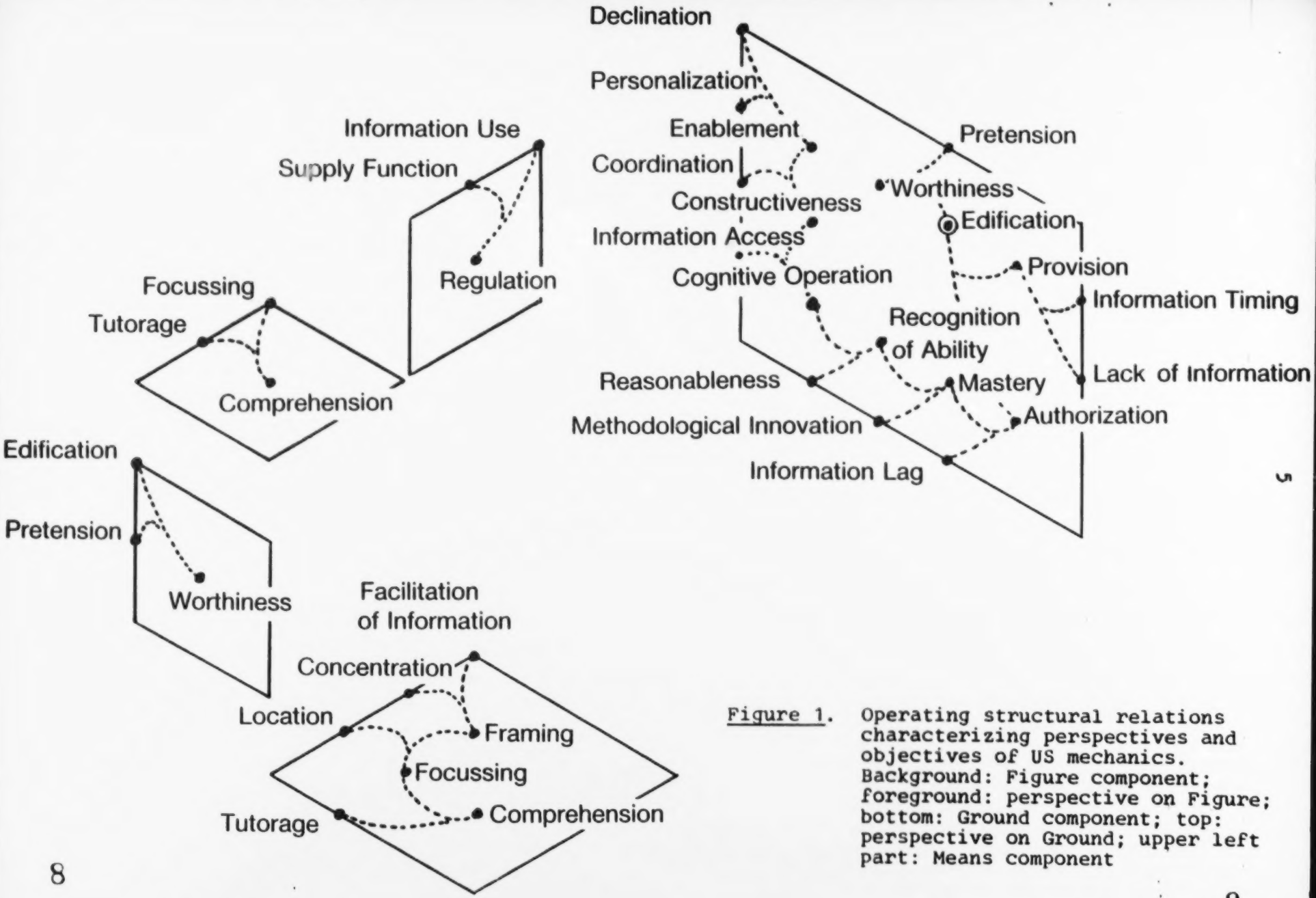

Figure 1. Operating structural relations characterizing perspectives and objectives of US mechanics. Background: Figure component; foreground: perspective on Figure; bottom: Ground component; top: perspective on Ground; upper left part: Means component

by Authorization. The second cycle produces Provision. When the second one crosses the first one, a new singularity is reached, namely Edification. The circle around this peak marks the effect of a deepening of the conceptualization. The third and final cycle transforms Edification into the highest point of the entire cognitive process, that is Worthiness. Thus a conception of merit and respect has emerged as the root of the mentality of US mechanics.

The terminal states and dimensions of the Ground component concern a Contextualization of information as well as Instruction. The two cognitive dimensions refer to Specialization and Framing, while the theme specific dimensions point toward a need for Selectivity.

The algorithm that has operated on the text material builds on a mechanism that binds the textual agent to various textual objectives. The differentiation of the perspectives on the Figure or the Ground respectively rests on this mechanism. The outcome shows that Worthiness is in the focus of the perspective on the Figure, while Comprehension is in the focus of the perspective on the Ground. Thus some central aspects are put together and become transformed to a new dimensionality. The development of the processes characterizing the perspectives on Figure and Ground are not only one-phased but also very short.

Swedish Mentality

The Swedish mechanics answered the same three questions. In all, there were 7 Swedish subjects whose unrestricted responses could be used for the analysis. The cubic space containing the structured information in this material is presented in Figure 2.

As before, the description will begin with the Figure component. The first terminal state, named Labourousness, includes most of the information. The process ends when it reaches its final singularity, Lack of Quality. The Figure is one-dimensional, thus expressing Plainness. The whole process is characterized by two very short cycles. The process leaps from the initial state

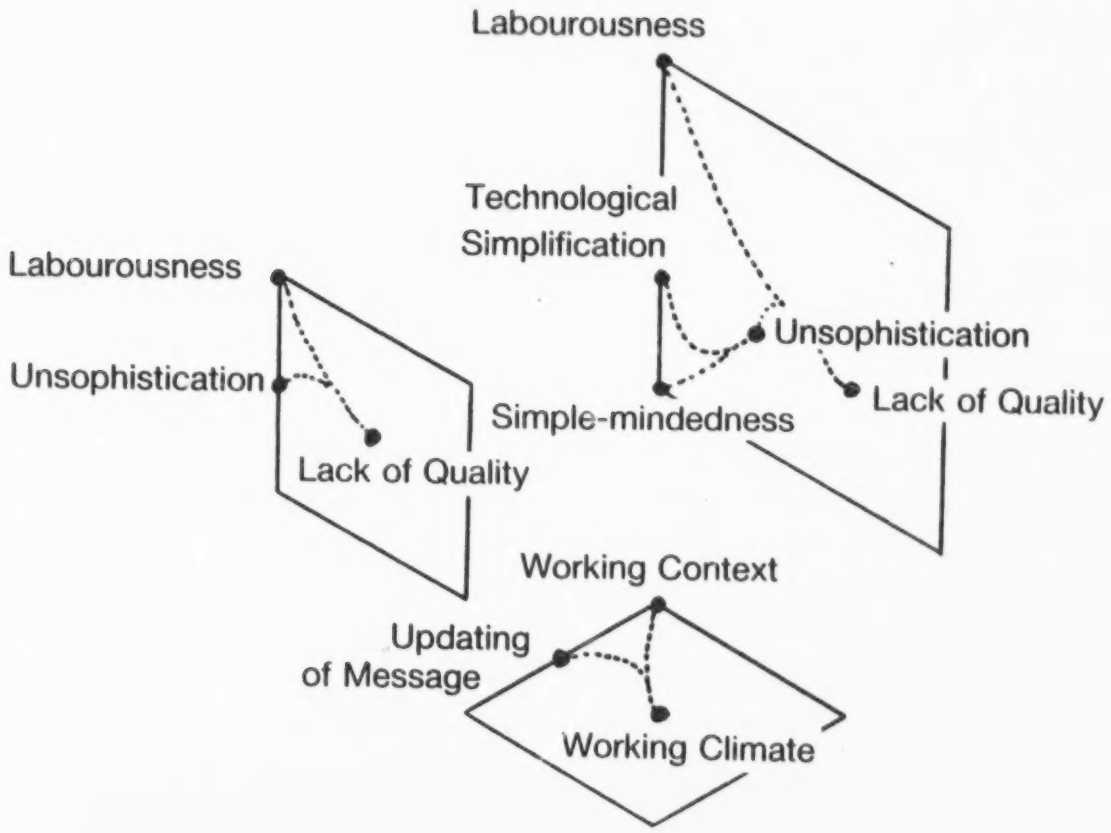

Figure 2. Operating structural relations characterizing perspective and objectives of Swedish mechanics. Background: Figure component; foreground: perspective on Figure; bottom: Ground component

into the second cycle, which produces Unsophistication. When this is transformed by Labourousness, the final peak is reached, which means that the natural or essential character of the work or goods produced is of low standard.

The Ground component expresses a one-step process. The transformation produces Working Climate as the only singularity in the Ground. There is no perspective on the Ground, while the perspective on the Figure focuses on Lack of Quality.

Discussion

Two kinds of texts were analyzed with the aim to detect and compare their category structures. This comparison of the structural relations shows striking differences. There is a clear indication that the categories are not only totally different but also differently related. Considering the cultural differences, the analyses point towards a fascinating divergency of worker mentality.

US workers exposed to Swedish management feel their Worthiness to be insufficiently recognized. They give expression to a need for being edified by the company. This concept may be seen as a necessary means to increase the subjective consciousness and to facilitate an inner-directed change of behaviour instead of outer-directed behavioural modifications. The final terminal state is Pretension, which is determined by the ratio of actual behaviour to supposed behavioural potential. The US workers bring about a self-directedness in that information is of concern to them. It is a necessary and as such an integrative part of their every-day life, at the same time as it is challenging.

Effective information management seems to be in the ground of their conception. It is the foundation of competence development. In this perspective, it is of great interest to them to be aided in their search for information. Without having access to simple quantitative functions, help can only be provided through Tutorage, which is the terminal state transforming the Focussing into Comprehension.

The Means component shows Information Use as initial terminal state. This focal point indicates the importance of information necessary in the production of knowledge within one's own area of competence. The process transits through the state marked Supply Function. Here the importance of a function for information pick-up transforms the initial state into Regulation, expressing a need for putting values on the presentation of information.

The Swedish mechanics seem to subordinate themselves to the company. They are unconcerned about information of technical kind. They indicate neither a feeling of any suppression of their ability nor any wish for challenging tasks. The first terminal state, Labourousness, indicates the motivation of the workers, labour discipline, rest hours, number of working days and salary claims. In particular the concept addresses these workers' outer-directedness, i.e., their fixation on getting paid for every time unit invested in their familiarization with the information needed. The next state, Technical Simplification, gives expression to the demand for simplified instructions. They are unconcerned about information related to their working knowledge. Simple-mindedness is the state which stands for the effect of an expressed unwillingness to invest efforts in order to reach a certain level of technical qualification. At this point the Swedes give evidence of the absence of refinement or a structural approach to instructional materials.

The Swedish conceptual ground is a one-step process, which starts with the terminal state of Working Context. It refers to conditions of the working place, particularly substances polluting the environment, air conditioning and cleanness. The second state, Updating of Message, refers to the import of being continuously informed about ongoing matters of value to the personnel.

As for information management within a US or a Swedish cultural setting, it can be stated that the experience conveyed by the US workers is grounded in the need for contacts with tutors to facilitate their comprehension of technical information. Such

a ground is absent in the Swedish workers.

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